MATERIALS

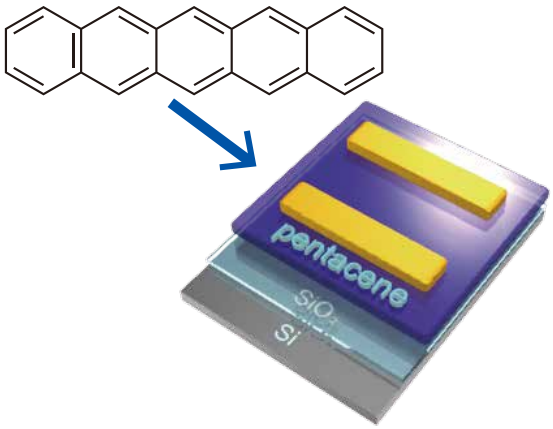
p-Type Organic Semiconductor High-purity and High-performance Pentacene

Pentacene (99.999%, trace metals basis)
(purified by sublimation) [for organic electronics]
100mg / 1g
[P2524]

Advantages

- **Electronic material grade [High-purity, low metal (< 10 ppm)]**
- **Extremely purified by sublimation**
- **Ensures semiconductor performance by OFET devices**
  [Specification: hole mobility > 0.35 cm^2/Vs (bare Si/SiO_2 substrate)]

Comparison of transistor performance



Top-contact device
[Si^{n++} / SiO_2 / pentacene / Au]

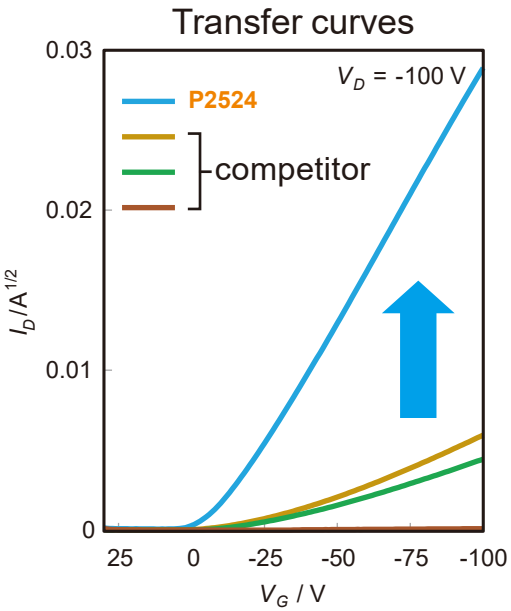


Table 1. OFET characteristics (using in-house equipment)

	Substrate	Hole Mobility (cm^2/Vs)	Threshold voltage (V)
P2524	Si/SiO_2 (bare)	0.39	-10
Competitor A (sublimed)		0.002	-25
Competitor B (sublimed)		0.001	-25
Competitor C (sublimed)		5.0×10^{-6}	-23

p-Type Organic Semiconductor: High-purity and High-performance Pentacene

Applications

The FET performance was significantly improved by surface modification with Self-Assembled Monolayer (SAM)(OTS: *n*-octyltrichlorosilane [O0168]); the OTS-treated device with the pentacene [P2524] demonstrated very high FET performance (Figure 1 and Table 2).

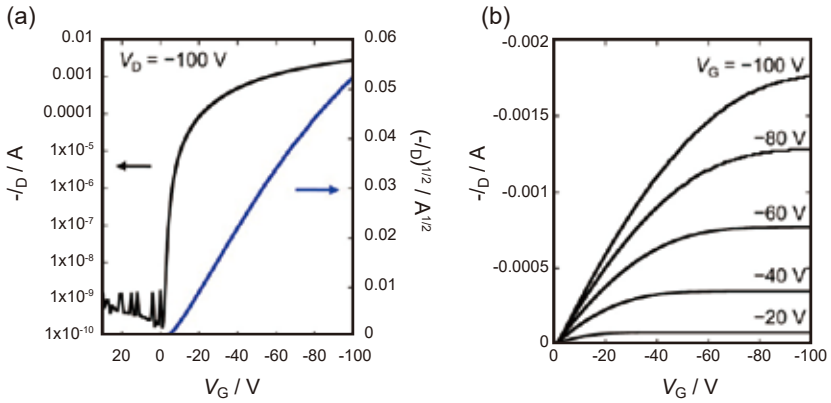


Figure 1. (a) transfer curves (b) output curves

Table 2. OFET characteristics (using in-house equipment)

	SAM	T_{sub} (°C)	Hole Mobility (cm^2/ Vs)	V_{TH} (V)	on/off ratio
Pentacene [P2524]	**OTS [O0168]**	RT	1.50 - 1.52	-5.7	1.5×10^7

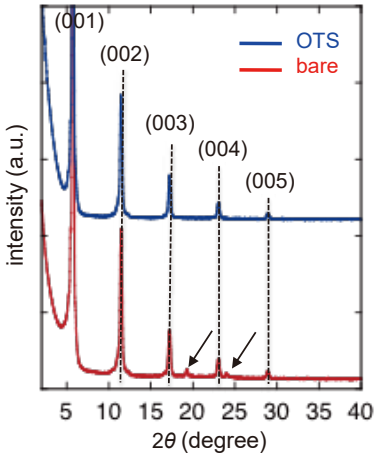


Figure 2. XRD analysis

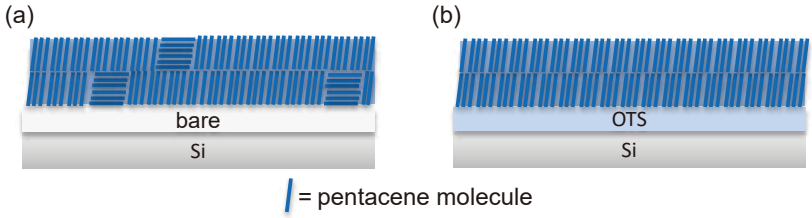


Figure 3. Orientation images of pentacene thin film form

In the bare device (without SAM), two weak peaks assignable to face-on orientation were observed (Figure 2, black arrow). This may cause a strong barrier to reduce carrier mobility (Figure 3a). On the other hand, the pentacene film on the OTS-treated substrate did not show such peaks (Figure 2). These results indicate that the OTS-treated device involves an excellent thin-film drastically enhancing the FET performance (Figure 3b).

A part of X-ray diffraction (XRD: Smart Lab) was conducted at Advanced Characterization Nanotechnology Platform of the University of Tokyo, supported by "Nanotechnology Platform" of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

Related Product

***n*-Octyltrichlorosilane (= OTS)** 25g [O0168]

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